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ABSTRACT

Three sources for school curriculum--the nature of the disciplines, the needs of society, and the needs of the individual--are described and discussed. Curricula designed upon each of these three sources are illustrated, with an emphasis upon minimizing the difference between the curriculum that is needed and the curriculum that is offered. The proposal is made that three types of schools, each utilizing curriculum based upon one of these sources, would be effective. Each type of school would contain environments that reflected characteristics of the curriculum source it concentrated upon. One type of school would be solely concerned with curriculum derived from the nature of the academic disciplines. Another type of school would be concerned solely with curriculum sampled from the needs of society. A third type would contain classroom environments concerned with curriculum sampled from the needs of individuals. The difficulty of containing the three types of curriculum within a single classroom is pointed out. The possibility of designing a single school containing various classrooms dealing with curriculum from each source, and employing a teacher who can utilize a model of teaching appropriate to that particular classroom environment, is briefly examined. (JD)

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CURRICULUM DESIGN, LEARNING ENVIRONMENT SPECIFICATION, AND CURRICULUM ERROR

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CONTENTS:

INTRODUCTION

ASSUMPTIONS

ASSUMPTION ONE

CURRICULUM DESIGN LITERATURE

PATTERN ONE

PATTERN TWO

PATTERN THREE

THREE CURRICULUM DESIGN PROCESSES

THE OVERALL CURRICULUM PARADIGM

1. SAMPLING FROM THE THREE SOURCES
2. INSTITUTIONAL PLANNING
3. LEARNING ENVIRONMENT CONSTRUCTION
4. MONITORING

THE CURRICULUM SAMPLING PROCESS

ASSUMPTION TWO - A MATHEMATICAL TREATMENT

THE IMPLICATION AND AN EXTRAPOLATION

CURRICULUM DESIGN, LEARNING ENVIRONMENT SPECIFICATION, AND CURRICULUM ERROR

INTRODUCTION

The discussion which follows grew out of a two year effort by the author to come up with a curriculum paradigm which would not rest upon undesirable assumptions. The particularly undesirable assumption that all curriculum should be sampled from only one source was avoided. The resultant paradigm which is explained in this article rests upon two assumptions. The two assumptions will be stated and explained, pertinent background from the literature will be discussed, three seemingly different curriculum design processes will be discussed, the paradigm will be explained, a mathematical argument will be presented which deals with probabilistic decision making within the paradigm, and implications of the paradigm will be offered.

ASSUMPTIONS

In order to facilitate communication regarding the paradigm, the assumptions upon which the paradigm rests, the frame of reference of this article, and several definitions have been presented in this section. Assumption one will be dealt with in added detail in the next section. Assumption two will be elaborated upon in a later section of this article after the paradigm has been presented.

Assumption One: There are three sources for school curriculum: "...the nature of the disciplines, the needs of society, and the needs of the individual..."[1]

Assumption Two: "Curriculum error," herein defined as the difference between the curriculum which is needed and the curriculum which is offered, should be minimized."

Every effort has been made to discuss a curriculum design process which will bring the three sources of the curriculum into better balance with one another and to simultaneously consider the minimization of curriculum error. A frame of reference has been adopted which views the school student in the context of the environment within which he/she is to learn. Curriculum design is herein the process whose end product is a set of "environmental specifications" which describe the nature of the learning environment. Instruction is herein defined as a process of "actualizing" the environmental specifications developed by a curriculum design process.

ASSUMPTION ONE

Even though the author has assumed that there are three sources of the curriculum, it still might be worthwhile to briefly examine the validity of the assumption. There is a great deal of agreement in the literature which indicates that the three sources mentioned in assumption one are the major sources of the curriculum, Tyler, for example, made extensive reference to sources which were very similar to those mentioned in assumption one.[2]

In 1962, the ASCD sponsored a symposium whose purpose was to bring prominent theorists together to discuss the question, "What are the Sources of the Curriculum."[3] The discussion, available in monograph form, provides an excellent perspective on several issues discussed in this article. In 1972, Stanley Elam, the editor of Kappan, invited members of the fraternity to submit articles addressed to the issue of bringing the three sources of the curriculum into better balance in curriculum planning and development.[4]

The reader may note that, while assumption one is certainly germane to the discussion, there is nothing critical about the number of sources or the particular three sources which have been herein assumed. One could certainly apply the discussion below to any arbitrary set of curriculum sources.

CURRICULUM DESIGN LITERATURE

In analyzing educational thought, particularly curriculum thinking, it is instructional to see how various writers cope with the three sources of the curriculum.

Three patterns seem to emerge.

PATTERN ONE

Some writers consider one of the three sources to be priority number one and consequently base their models around that source. Examples would include Robert Ebel who claimed that: "I believe it is that schools are for learning, and that what ought to be learned mainly is useful knowledge."[5] Another example would be L. Craig Wilson who alligned himself with the same source when he stated:

"Educative encounters are best defined as environments, having as their main substance the more stable disciplines of knowledge."[6]

Another example, based upon a different source comes from T. Robert Bassett who, after discrediting the usefulness of two of the sources states that: "What it (education) can do is help the individual make himself into the kind of person he wants to be.... Dealing solely with the individual on his own terms, for the sake of his self-fulfillment, education would have a clear purpose and a built-in validity to justify itself."[7]

PATTERN TWO

Many writers sidestep the need to cope with the three sources of the curriculum. Hence, it is often necessary to make inferences about their writings by analyzing them semantically. It is possible to make such inferences by analyzing the words used to explain or describe the model. Consider the following sentences from a sample of O'Hanlon's writing.[8]

> "The basic characteristics of this model are two: 1) drawing on a study of the culture or society to determine curriculum purpose and 2) going through a series of steps to move from a generalized sense of curriculum purpose to very specific statements of curriculum purpose.
>
> Interpretations of the Cultural Context
> The first step in arriving at curriculum purpose is to study the culture or society which the school serves.

In this sample, O'Hanlon doesn't come right out and assume the needs of society to be the primary source of the curriculum, but one might make that inference from his choice of words.

PATTERN THREE

Some curriculum writers do deal with all three sources and do make an effort to justify their models from the point of reference of all three sources. Consider for example a model proposed by Kelley whereby the curriculum is based upon the societal source, but, offered up in such a way as to provide a sort of curriculum "smorgasbord" from which the individual student chooses. The dictates of the disciplines are seen as being delimiting factors from which the curriculum "software" is drawn. Delimiting in the sense that the each discipline forms a "set" from which curriculum offerings must be drawn. Each "set" is consequently affected by the characteristics of its content.[9]

THREE CURRICULUM DESIGN PROCESSES

The recognition of different sources for the curriculum poses an interesting question. Are curriculum design processes linked to the various sources, i.e., does each source require a different design process?

Suppose one were to decide that the "needs of society" should be the major source of the curriculum and that the other two sources were of lesser significance. One would then proceed along a process similar to that outlined by O'Hanlon and:

1. consult societal data sources
2. in order to determine curriculum purpose or goals
3. breakdown these goals into curriculum units and ultimately
4. arrive at specific statements of objectives
5. Implementation procedures, methods and evaluation would of course be simultaneously and continually considered

The process sketched out above proceeds from general (societal matters) to specific (objectives).

Suppose on the other hand, one assumed that the "needs of the individual" should be the primary curriculum source and that the other two were of lesser significance. One might then proceed along a process similar to:

1. determine each individual student's immediate (or long range) idiosyncratic needs
2. decide which of these needs the school could successfully meet
3. structure an environment which meets these individual needs
4. continually monitor student needs and environmental match up

It is possible, but not necessary, to view this process from the point of reference of developmental psychology. (If this is done, a given set of student needs is preassumed. For example, one could assume that each student needs to grow along dimensions such as those outlined by: Piaget, Harvey Hunt and Schroeder, or Maslow.)

This process would seem to be the reverse of the first one described. It would progress from specific (individual student needs) to general considerations (What is the total school environment to be like?)

The third determiner would seem to require a third, and distinctly different approach. If the "nature of the discipline" is to be prioritized above the others then one might:

1. either study the conceptual structure of the discipline or the processes used by those working at scholarly efforts within the discipline
2. determine which of these (concepts and processes) are the most desirable for students to know about or be capable of doing and
3. reduce these to specific objectives or processes for inclusion as curriculum
4. evaluate on a conceptual or process basis with subsequent revision as the content or the process of the particular discipline changes (It is incidentally the view of many futurists that the body of content changes at an exponential rate.)

This process would seem to go from general (concepts and processes of a discipline) to specific (course objectives).

It is interesting to note that the two sources which have received the most attention historically both require processes which proceed from general to specific.

If the three processes sketched out above are significantly different, then the implication might well be that each process must be in simultaneous operation within our schools. If the three processes are similar, the implication may be that one process could be in operation within the schools. In Figure 1, the processes have been placed side by side to facilitate an examination of their similarities.

FIGURE 1

Abridged Curriculum Design Processes for each source of the curriculum

Societal Source	Individual Source	Disciplinary Source
1. Consult societal data sources.	1. determine idiosyncratic student needs.	1. study conceptual structure or processes of the disciplines.
2. determine curriculum purpose or goals	2. decide which needs the school can meet	2. determine which of above are relevant to students
3. breakdown curriculum purpose into curriculum units	3. structure the learning environment to meet student needs	3. generate content or process objectives
4. arrive at specific statements of objectives	4. monitor student needs and environmental match	4. evaluate curriculum by testing student content/process attainment
5. implementation procedures, evaluative feedback.		5. feedback

Scrutiny of Figure 1, yields the observation that the three processes use very different words to describe somewhat similar processes. Figure 2, has been drawn up to illustrate this point.

FIGURE 2

Similarities in the Curriculum Processes

Process Stage	Societal Source	Individual Source	Disciplinary Source
Sampling from the curriculum Source	1. Societal/ cultural data consulted	1. individual student needs are assessed.	1. disciplines are consulted or sampled
Institutional Planning	2. Purpose, goals, and objectives are prepared.	2. school decides which student needs can be met	2. relevance of above is judged, content or processes are generated
Learning Environment Construction (curriculum becomes a reality)	3. Student performs Learning experiences	3. Learning environment is designed and implemented wherein students needs can be met	3. Students perform Learning experiences, or are involved in processes
Monitoring	4. evaluative evidence/ feedback	4. student needs environment match is monitored/ feedback	4. student content/ process attainment is tested/ feedback

The author experienced a great deal of difficulty in designing Figure 2. The difficulty was with the choice of the various words or terms used to describe each process stage. The problem was a frame of reference problem. If words were chosen which most adequately described the particular process (within each column of the figure), the similarity of the processes across the figure was less evident. If words were chosen which portrayed the similarity of

each process to every other (columns), the process descriptions in each column suffered. The figure is a result of an attempt to hit a "happy medium" between the above two approaches.

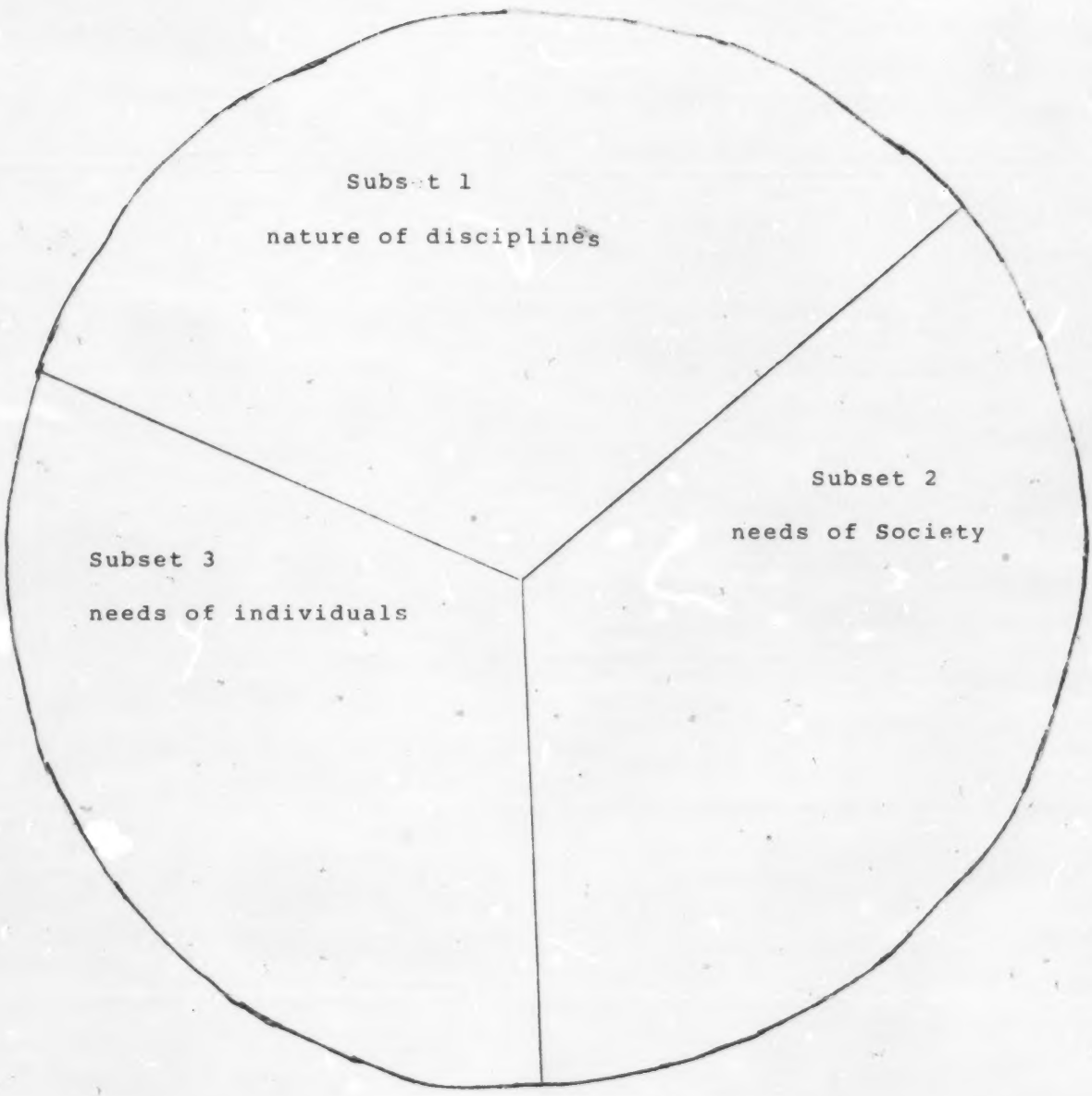
THE OVERALL CURRICULUM PARADIGM

The three processes abridged and outlined in figures one and two can be summarized into a four step process.

1. SAMPLING FROM THE THREE SOURCES. The three sources of the curriculum can be defined as being three "subsets" contained within the larger "set" which we often term "reality". See Figure 3. Sampling would mean that curriculum is to be drawn from or selected from its sources. It is worthwhile to briefly note that this sampling process could be accomplished in a random fashion which would free it from the value judgements of curriculum workers. More will be said about this sampling process later.

FIGURE 3

Reality



2. INSTITUTIONAL PLANNING. After the curriculum has been sampled, it must be operated upon. One could think of this as similar to the mathematical process of "mapping." "Mapping" is the process of drawing from one set (usually called the domain) and transforming each element in a certain fashion (usually governed by an equation) in order to generate a new set of elements (called a range). The "mapping" could combine elements from the domain, subdivide them, or not place them in the range at all. Several kinds of questions may need to be answered depending upon the element sampled from the domain (or source of the curriculum). For example, for each element of curriculum sampled from the sources/domains one would have to decide if it was within the scope of the schools to deal with that particular element. Another obvious decision which might need to be made concerns the way the elements will be packaged and served up to students. It is at this step in the process that value judgements are most likely to enter into the process. The output (or domain) which results from this phase of the process is best described as specifications of the learning environment. This point needs some clarification. If schools are learning environments, teachers may be viewed as people who set about to build those environments. Curriculum may be thought of as the blueprints or specifications which are to be used in the building process. The environment, particularly if it is to be a social environment, is never really finished.

3. LEARNING ENVIRONMENT CONSTRUCTIONS. Once the specifications are drawn up in step two, it is then necessary that they be actualized. At his point the traditional boundry lines between curricu-

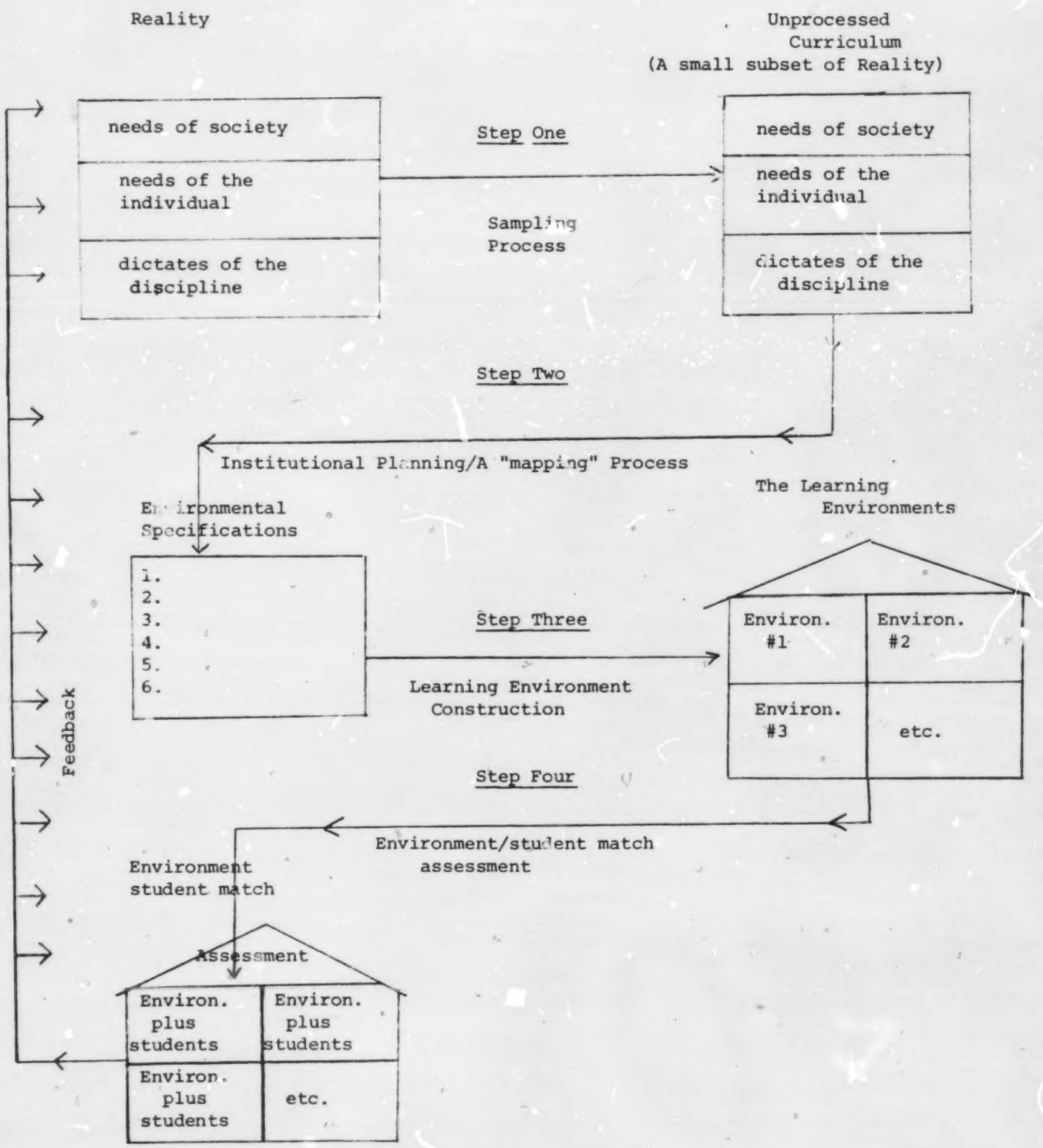
lum and instruction begin to break down completely. For example, a specification may call for the creation of a particular type of social environment. The specification, for example, might call for a very supportive social environment. The teacher would then become a part of the curriculum.

4. **MONITORING.** This step in the process calls for a continuous monitoring of the environment and its effect upon students. This step is usually included in any curriculum design process and termed feedforward and feedbackward. The step is obviously concerned with examining the student environment match. One can easily illustrate the importance of this step in the process by the analogy of students to green plants. Placing a small frail topical plant into an arrid environment certainly doesn't produce growth of the plant.

The four steps in the process outlined above have been diagrammed in Figure 4.

FIGURE 4

The Overall Curriculum Design Process



THE CURRICULUM SAMPLING PROCESS

The selection of curriculum from its sources (overall process step number one) can be accomplished in a number of ways. Two of these methods will be discussed in this section.

Method number one is to predetermine a set of guidelines for the selection process. This process is analogous to the statistical technique known as "weighted sampling." This process involves determining a proportion or weighting which will be sampled from each of the three subsets (sources) in Figure 3. For example, it might be predetermined that 50% of the curriculum should be derived from the disciplinary source, 30% of the curriculum should be derived from the societal source, and 20% of the curriculum should be derived from the individual source.

There is one highly controversial question involved in this method of curriculum sampling and that is: "Who shall decermine the priorities or the weighting?" Two possibilities immediately come to mind. First, one might reason that those most affected by the decision should have the largest say in the matter. One would then be concerned with developing a mechanism (or an instrument) to determine the feelings of the "patrons" of education. Those most directly affect such as parents, students, and employers of students would be polled. One might choose to use a method such as the "Delphi" technique which forces a concensus.[10] This approach has a great deal of appeal to many educators because it involves a broad based decentralized decision making process. Opponents of this approach might point out however, that "a million right guys could be wrong."

A second approach to answering the question of who should be involved in the weighting would be to reason that those who are the most capable should make the decision. The decision would then be placed in the hands of educators, particularly curriculum designers and administrators. Opponents of this approach might point out that the process could very well become an intellectual, theoretical, and very academic process.

Irregardless of who is involved in the decision making process, method number one described above involves value judgements. It is curriculum design by concensus or professional judgement.

ASSUMPTION TWO - A MATHEMATICAL TREATMENT

The discussion which follows is an attempt to examine assumption two, that "curriculum error" should be minimized, utilizing a mathematical model. "Curriculum error" was earlier defined as the difference between the curriculum which is needed and the curriculum which is offered. This discussion will point up a possible alternative to curriculum sampling by consensus as discussed above.

Suppose:

A. A curriculum worker chooses curriculum from its three sources (see figure 3) in a proportion represented by the ordered triplet (C_1, C_2, C_3). To avoid using per cents, let $\sum_{i=1}^{3} C_i = 1$ and $0 \leq C_i \leq 1$.

B. The "supreme superintendent" of schools simultaneously determines (through experiment, divine assistance or some other similar method) that the curriculum should

be in the proportion represented by the ordered triplet (S_1, S_2, S_3). Again, to avoid using per cents, let $\sum_{i=1}^{3} S_i = 1$ and $0 \leq S_i \leq 1$.

C. The curriculum worker is interested in choosing the curriculum in such a way that he will minimize the difference between his choice and the superintendents choice, i.e., the curriculum worker would like to minimize two types of error:

1. the error in each component of the curriculum which we can mathematically define as:

$$E \equiv \max \; (C_i - S_i)^2 \; ^*$$

2. the total error in the curriculum which we can mathematically define as:

$$E' \equiv \sum_{i=1}^{3} (C_i - S_i)^2 \; ^*$$

THEN: What strategy could the curriculum worker employ to minimize the two errors. Below are three possible alternatives which the curriculum worker might consider:

A. He might randomly choose the ordered triplet, for example (.1, .5, .4).

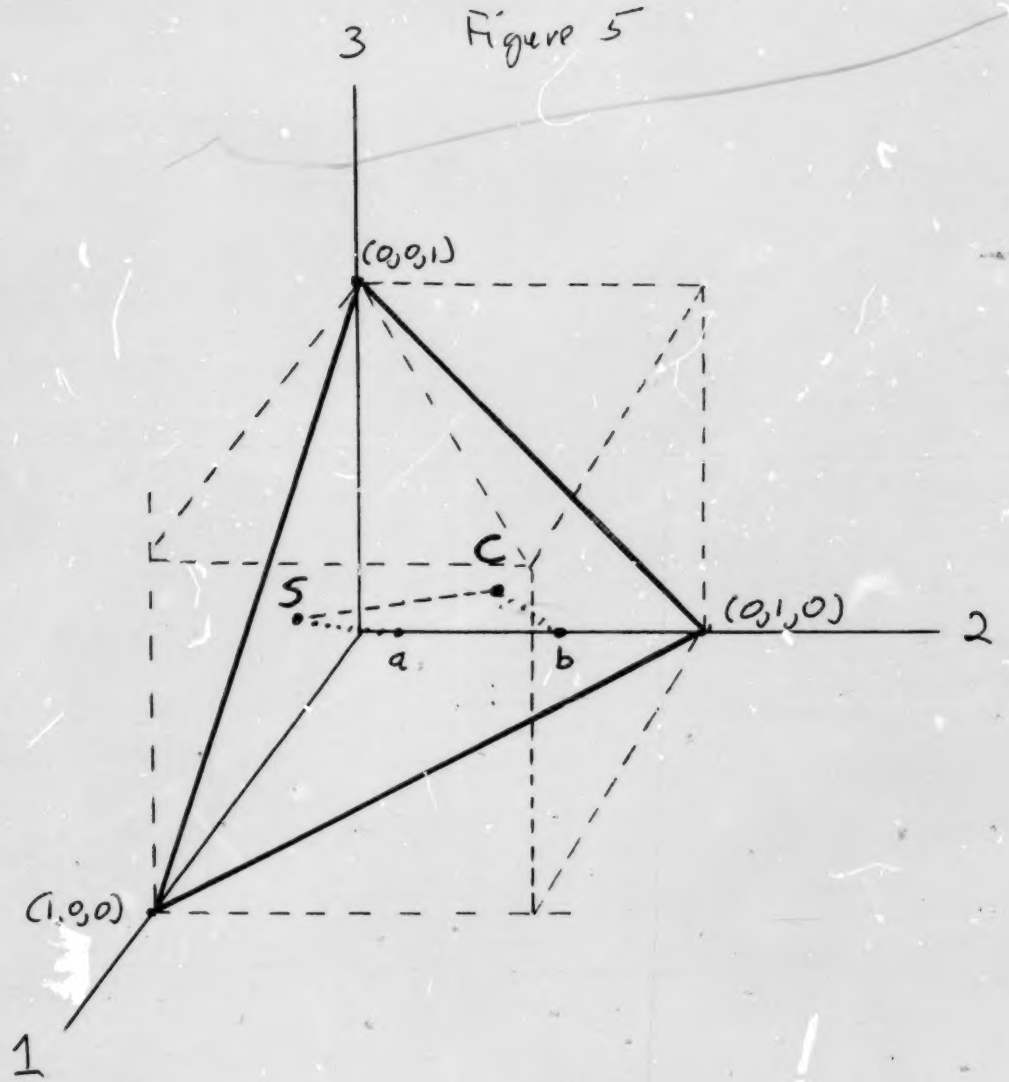
B. He might maximize or load up one component, for example (1, 0, 0).

C. He might choose from each component equally, for example $(.3\overline{3}, .3\overline{3}, .3\overline{3})$

The curriculum worker's problem has been diagrammatically represented below.

*Squares are used so as to avoid the use of absolute values.

Figure 5



where: $S = (s_1, s_2, s_3)$ and $C = (c_1, c_2, c_3)$

A. The error in each component of the ordered triplet $E=(c_i-s_i)^2$ is the distance between the two points projected onto each axis of the graph. The error in the second component of the ordered triplet has been shown (see figure 5) as the distance from point a. to point b.

B. The total or summed error $E'=\sum_{i=1}^{3}(c_i-s_i)^2$ has been shown (see figure 5) as the distance between the two points on the plane, S. and C.

C. The reader will notice that because of the condition $\sum_{i=1}^{3} c_i=1$ and $\sum_{i=1}^{3} a_i=1$, the problem reduces to a two dimensional problem represented by the plane through points (1,0,0) (0,1,0) and (0,0,1).

It can be shown mathematically that If the curriculum worker desires to minimize the two types of error as herein defined, that his best choice is to always choose the point (.33, .33, .33).

The above discussion regarding the sampling of curriculum has been included herein to prove a point. The point being that some sort of a stratified sample is probably a more valid approach than a non-stratified approach. There is no concrete research evidence which the author knows of which would suggest that students need a curriculum sampled from only one source of the curriculum. But, neither is there any evidence which the author is aware of which would give professional educators guidance in the curriculum sampling process. The most desirable course of action may therefore be one which minimizes possible curriculum error.

THE IMPLICATION AND AN EXTRAPOLATION

After Bruce Joyce and Marsha Weil discussed considerations similar to those discussed in this article, they concluded that we probably need three types of schools.[11] Each of the three types of schools would utilize curriculum which had been sampled from only one of the sources. Each type of school would contain environments which reflected characteristics of the curriculum source it concentrated upon. For example, one type of school would be solely concerned with curriculum derived from the nature of the disciplines. Information retrieval systems and elaborate media software collections would be housed in this type of school. The second type of school would contain classroom environments concerned solely with curriculum sampled from the needs of society. These environments would be designed to facilitate communications between the inhabitants and would probably contain issue oriented current resources in a lounge type setting which would facilitate informal group discussions.

The third type of school would contain classroom environments concerned solely with curriculum sampled from the needs of individuals. Because individual student needs are probably very idiosyncratic in nature, this type of school would have very flexible environments whose major attribute could be their staffing arrangements.

Joyce and Weil further suggested that teachers would utilize models of teaching appropriate to the type of school wherein they taught.

It would seem improbable that the three environmental types discussed above could be merged into one single classroom. No one teacher could handle the simultaneous creation of a single classroom environment which would have all the attributes of the above three types of environments. It does seem that his is exactly what we are now as a profession expecting of our schools and our teachers. It might be possible, however, to design a single school which would contain various classrooms of each environmental type, which dealt with curriculum from each source, and which employed a teacher who utilized a model of teaching which was appropriate to that particular classroom environment. Perhaps we might even be able to match the students to the particular type classroom environment each needed. Perhaps this prescription would take the form of saying that Johnny needed to spend 50% of his time in the "societal" classroom, 30% of his time in the "individual needs" classroom and 20% of his time in the "informational classroom." Perhsps we would find that as Johnny grew older, he would need more time in the "informational classroom" and less time in the others.

FOOTNOTES

1. Elam, Stanley, (Ed.), "PDK Search." Kappan, (Sept. 1972) Vol. LIV, No. 1, p. backcover & 32.

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8. O'Hanlon, James, "Paradign #1: A Systematic Approach to the Curriculum Development Process." Unpublished paper, University of Nebraska, Lincoln, Nebraska.

9. Kelley, Ed, Personal conversation, University of Nebraska, Lincoln, Nebraska, 1973.

10. _____, "The Delphi Technique." Kappan

11. Joyce, Bruce, and Marsha Weil, Models of Teaching. (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1972) especially pp. 340-1, and pp. 319-347 for background.